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Proceedings of the Fisheries Management Studies Working Group

24-25 February 1999

Maritime Centre
Halifax, Nova Scotia

and

21-23 June 1999

Gulf Fisheries Centre
Moncton, New Brunswick

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Abstract

The Working Group (WG) met on 24-25 February 1999 to initiate discussion on implementation of the Precautionary Approach (PA) in the management of harvest fisheries in the Maritimes Region. This discussion was continued at a meeting on 21-23 June 1999. It is the intention of the WG to produce a discussion paper, based on the consensus views developed at these meetings, which will facilitate adoption of the PA in Regional fishery management. At the June meeting, reports were also received on studies relevant to the WG's work that were supported under the Strategic Science Fund project on Evaluation of Fishery Management Systems in 1998-99. These concerned an evaluation of the Dockside Monitoring Program, an evaluation of fishing effort regulation, a description of the functioning of Community Management Boards and a pilot implementation of a method for detection of discarding at sea. A statistical model of optimal observer coverage and deployment was also discussed.

Résumé

Le Groupe de travail (GT) a tenu une rencontre, les 24 et 25 février 1999, pour entamer la discussion sur la mise en oeuvre de l'approche préventive (AP) dans la gestion des pêches de capture dans la Région des Maritimes. La discussion s'est poursuivie lors d'une rencontre tenue du 21 au 23 juin 1999. Le GT a l'intention de produire, à partir des opinions consensuelles recueillies lors de ces rencontres, un document de travail qui facilitera l'adoption de l'AP pour la gestion régionale des pêches. Lors de la réunion de juin, des rapports ont aussi été présentés sur des études pertinentes au travaux du GT, et qui recevait l'appui du Fonds stratégique des sciences pour l'évaluation des systèmes de gestion des pêches en 1998-1999. Ces rapports consistaient en une évaluation du programme de vérification à quai, une évaluation de la réglementation de l'effort de pêche, une description du fonctionnement des conseils de gestion communautaire et un compte rendu de la mise en oeuvre d'un projet pilote de détection des rejets en mer. On a aussi discuté d'une modèle statistique d'optimalisation du déploiement des observateurs et de la couverture des zones.

FISHERIES MANAGEMENT STUDIES WORKING GROUP

REPORT OF MEETING – 24-25 February 1999

The Working Group met for the afternoon of 24th February and all day on 25th February 1999 in the Maritime Centre, Halifax, to discuss two related items: implementation of the Precautionary Approach for harvest fisheries, and criteria for reopening closed fisheries, in a Maritimes Region context. The Agenda is in Annex 1 and participants are listed in Annex 2.

The Working Group has had discussion of the Precautionary Approach on its agenda for the last two years but action was delayed until other groups, particularly ICES and NAFO, had progressed in their deliberations of this topic. The FMS Working Group sees its role as distilling, translating, interpreting and extending the intensive and highly technical work of these other groups into forms of practical use to managers and clients, thus facilitating the adoption of the Precautionary Approach in the management of Maritimes Region fisheries. The agenda adopted for this meeting was wide ranging and the meeting was used to explore the scope of the issue. The Chairman decided after the meeting to draft the record of the discussions in the form of a briefing for clients on the implications of adopting a Precautionary Approach for Maritimes Region fisheries, and to bring this draft before the next meeting of FMSWG in June 1999 for amplification and approval.

A number of recommendations were made for further work as follows:

1. **Reference Points and Decision Rules**

It was agreed that the FRCC Discussion Paper on "Considerations on Reopening a Closed Fishery" provides a sensible direction for further work on criteria for opening and closing fisheries. It is recommended that a paper be prepared on what indicators should be adopted as the basis for re-opening criteria for the presently closed management units in the Maritimes Region, what thresholds should be used for re-opening and what weightings should be given to each indicator. The paper should also address criteria for closing fisheries, including for 'data rich' and 'data poor' management units. The models underlying these indicators should be described, and the scientific basis for these should be documented. It would be most helpful if this paper was ready for review at the next meeting of the Working Group planned for June 1999. This would allow accepted criteria to be included in the remit for the next round of marine fish stock assessments (fall 1999 for Scotian Shelf and spring 2000 for Southern Gulf of St. Lawrence). This application should be considered as a pilot to test the performance of the criteria under a variety of circumstances.

ACTION: SINCLAIR, FRANK

It was recommended that, subsequent to the proposed June meeting of the Working Group, discussion be undertaken with Fisheries Management and Enforcement staff on work needed for definition of harvesting strategies during the rebuilding stage, evaluation of capability to

control a small fishery during the initial phase, definition of management rules, and preparation of a fishing plan (steps 4 to 6 in the FRCC discussion paper on "Considerations on Re-opening a Closed Fishery" (FRCC95.TD.1).

ACTION: SINCLAIR, PEACOCK, BURKE.

Recognizing the need for more detailed consideration of the need for social and economic Reference Points and Decision Rules, the Working Group proposed that a discussion paper on these should be prepared for consideration at a future meeting of the WG.

ACTION: BURKE

2. **The Ecosystem effects of Fishing**

The Working Group decided to return to this topic in about a year from now to consider the implications of progress made. It was recognized, however, that this group is not the appropriate one to evaluate the science surrounding this issue. It would welcome a discussion paper synthesizing expert opinion from, say, the RAP Ecosystem Working Group.

ACTION: O'BOYLE

3. **Adequacy of the Present Management Framework**

Although all the elements for a satisfactory, robust, planning process for particular fisheries may be embodied in the Integrated Fisheries Management Plan (IFMP) framework, this is not in itself a guarantee that any particular plan will be consistent with the Precautionary Approach. A checklist, against which conformity of plans to the PA could be evaluated, would be a useful adjunct to the IFMP template. Such an audit, with appropriate modifications, could be applied also to Integrated Ocean Management Plans and developing fisheries plans. It was agreed that a PA audit would be devised for application to IFMPs, and tested by the Working Group.

ACTION: STEPHENSON

It was noted that the Oceans Sector had gone so far as to announce the Eastern Scotian Shelf as a pilot Ocean Management Area (OMA). It was agreed that the Working Group should take this area as a test case for evaluation of the consistency and comprehensiveness of the IFMPs for fisheries conducted within it. Collaboration with the Oceans Sector in this would have some benefit and it was agreed to discuss this with them (Faith Scatallon).

ACTION: O'BOYLE, SINCLAIR

The Working Group was unfamiliar with the present status of the Developing Fisheries Policy and requires an up to date review before further comment can be made on its consistency with the PA. It was agreed to request a list of development projects (needed for the area integration of plans proposed above), a statement of where the process stands and a copy of the latest draft policy. It was agreed also to solicit participation in the Working Group by the project leader (Odette Murphy).

ACTION: O'BOYLE

4. **Performance Indicators**

The Working Group finds it difficult to over-emphasize the importance of compliance indicators, while recognizing the difficulty of developing these. It was agreed to initiate discussions between Science, Enforcement and Resource Allocation to develop proposals as to how this issue could be addressed.

ACTION: HALLIDAY

FISHERIES MANAGEMENT STUDIES WORKING GROUP

REPORT OF MEETING – 21-23 JUNE 1999

1. Approval of Agenda

The approved agenda for the meeting, held at the Gulf Fisheries Centre, Moncton, is in Annex 1. A list of participants is in Annex 2. Working Papers and other documents tabled during the meeting are listed in Annex 3.

2. Use of a Precautionary Approach for Harvest Fisheries in Maritimes Region

2.1 Reference Points and Decision Rules

The working group received two presentations on the subject of expanding the suite of indicators considered in evaluation of fishery status. Summaries of these papers follow.

Working Paper 99/44: This paper reviews criteria for the reopening of closed fisheries as provided in FRCC documents on this topic (FRCC.95.TD.1; FRCC.96.TD.2) and by other authors, and provides a critique of these. An analysis of the recent advice of the FRCC regarding the reopening of fisheries, using 4TVn and 3Pn4RS cod as examples, indicates that the criteria developed in FRCC.96.TD.2 for reopening these fisheries were apparently not followed. Alternatively, undefined criteria related to fishermen's perceptions of the state of stocks (or socio-economic conditions) may have outweighed the biological criteria defined in the earlier documents. These case studies emphasize the need to pre-establish sets of criteria (reference points) that are broader than biological in scope, and the weightings that these are to be given in decision-making.

NAFO SCR Doc. 99/1: At a recent meeting of the NAFO Scientific Council, participants considered three example stocks for the application of precautionary methods, including one 'data poor' stock, i.e. shrimp (*P. borealis*) on Flemish Cap (NAFO Division 3M). For stocks such as 3M shrimp, for which quantitative reference points, targets or limits could not be defined, Scientific Council endorsed the interim use of stock specific checklists which include multiple, qualitative indicators of resource status. This method, which is similar to the matrices used in Environmental Impact Assessment, is termed the Traffic Light because assessment results are summarized as green, yellow or red, corresponding to good, unknown or poor stock conditions. Recent stock assessments for Atlantic Canadian shrimp stocks, including the Scotian Shelf, the Gulf of St. Lawrence and the Labrador-Newfoundland Shelf, were conducted using the Traffic Light and results were viewed positively by fisheries managers and industry. A major drawback of the method is that it does not link assessments to TACs or other management controls. Modelling results suggest that Traffic Light results

could be linked to simple harvest control rules in a way that is consistent with shrimp stock dynamics and management requirements.

Impetus for pursuing the avenue of multiple indicators comes from the perception that the two most widely used indicators, fishing mortality rate (F) and spawning stock biomass (SSB), do not adequately integrate all of the information relevant to stock status. In any case, for many stocks (referred to as data-poor) estimates of these parameters cannot be derived. There is also a view that, even in data-rich situations, there remains substantial uncertainty about the estimates of F and SSB, and that sole dependence on these is unwise. This multi-indicator approach also provides scope to integrate fishermen's knowledge into decision-making, and also indicators relating to objectives broader than the status of a single stock, e.g. ecosystem, economic and social, which may need consideration in a comprehensive fisheries management framework.

There was consensus that indicators should be meaningful, independent and empirically derived. For each indicator, it is necessary to develop an understanding of how the indicator relates to stock status (or the status of another element of the management system) and what states of the indicator are classified as unacceptable outcomes. There was some debate about the relative merits and deficiencies of indicators derived from models versus 'simple' indicators. For example, we desire an indicator of biomass trends. A model-based biomass indicator could be obtained from a calibrated VPA while a simple indicator might be obtained directly from catch rates. (It was noted, however, that even simple indicators implicitly assume an underlying model linking observation to the population state of interest.) Some considered that the simple indicators would be more robust because they involved fewer structural assumptions about population dynamics. The WG agreed that the process should involve identification of the population characteristic of interest first. Review by technical experts should then determine if the 'best' indicator of this population characteristic is obtained from a simple model or a more complex model, recognizing that complexity is a continuum. However, the Working Group cautioned against using both the observation, e.g. catch rates, and a model output which uses that same observation, e.g. biomass from VPA calibrated to the catch rates, as this violates the independence principle. Relative indicators, from either simple or complex models, which monitor direction of change may be more robust than point estimates and sufficient for formulating advice on alternative tactics.

The Precautionary Approach explicitly directs that uncertainty be taken into account in the decision process. For fisheries managed by TAC, it is practical to summarize stock status advice in the form of a chart or table that characterizes the chance that the indicator value(s) will be in an unacceptable outcome zone for alternative catch quotas. Similar summaries could also be constructed for other management tactics. Alternatively, all the chances for the various indicators could be integrated, perhaps through some weighted average process, to come up with an overall chance that unacceptable outcomes would result from alternative actions of a management tactic. Further work is required to explore how this integration might be accomplished and to determine whether integration is indeed desirable.

The WG endorsed the view that consideration of a broader range of indicators, to guard against missing some important characteristic of fishery status, may be more precautionary than current practice. An ad hoc task group was formed to review the many possible stock status indicators that have been suggested and to select a subset that best meets the requirement of being empirical, meaningful and independent. The task group should have their selections applied to several stocks during the next round of Scotia-Fundy groundfish stock assessments conducted later this year as a pilot application. As there has been a propensity to date to use multiple simple indicators in situations where models are difficult to fit, it would be instructive to apply these simple indicators to situations that are considered to be well modeled and compare results. (Task Group participants: G. Chouinard, P. Fanning – coordinator, K. Frank, S. Gavaris, R. O'Boyle, R. Stephenson.)

ACTION: FANNING

2.2 A Precautionary Approach Audit for Integrated Fishery Management Plans

It was agreed at the February 1999 meeting that a checklist was required against which conformity of IFMPs to the PA can be evaluated. A draft checklist of a PA audit for IFMPs was tabled as requested, but it was decided that the proposed discussion document (see below) should be completed before proceeding with any further review of the IFMP procedure.

The fate of the WG's recommendations for modifications to the IFMP template, made at its 23-25 February 1998 meeting, is reported under agenda item 8.1.

2.3 Area-based review of IFMPs

At the February 1999 meeting of the WG, it was agreed that the Eastern Shelf would be taken as a test case for evaluation of consistency and comprehensiveness of the IFMPs for fisheries within it. This area was chosen because the Maritimes Region Ocean Act Office, as part of a new approach to ocean management, has established an Eastern Scotian Shelf Integrated Management (ESSIM) project as a pilot.

A working paper entitled "An Overview of IFMPs Relevant to the Eastern Scotian Shelf from a Fisheries and an Oceans Perspective" was presented to the WG (Working Paper 99/50) that provided a summary of all resources and associated fishing plans. It was found that a number of the resources did not have associated IFMPs. However, most resources did have some document on fishery management activities.

Each plan was evaluated according to a series of questions from a Fisheries and an Oceans perspective. The Fisheries questions were those developed by the WG in February 1998 to audit IFMPs. The Oceans questions used the same outline as the fisheries questions but were pertinent at ecosystem considerations. Overall, the paper identified a number of gaps and inconsistencies in the IFMPs in relation to broader ecosystem considerations of biodiversity, trophic interactions and habitat productivity. This was not entirely unexpected as these plans

were developed from the management perspective of a single species or species group. The next overview phase was still to be undertaken.

The authors made clear that this was work in progress and that the feedback of the WG would be used to direct future activities. The WG noted that the purpose of this particular exercise was to identify gaps and inconsistencies among plans for the Eastern Scotian Shelf. Although review of the individual plans was a necessary first step, the WG recommended that the plan ratings should be removed from the document. The integration of Fisheries and Oceans perspectives from the initial stage of this analysis was considered a positive turn of events and continued work along these lines was encouraged.

2.4 Developing Fisheries Policy

In response to the WG's request for an account of the present policy on developing fisheries (so that comment could be made on its consistency with the PA), a working paper was tabled entitled "The Emerging Fisheries Policy" (Working Paper 99/43). It consisted of a set of overheads summarizing the current developing fisheries policy in the Maritimes Region, the administration of the policy and problem areas. The appendices included a copy of the policy, terms of references of the various Developing Species Advisory Boards (DSABs) and a copy of the Pacific Region's emerging fisheries policy. Also circulated to the WG was a list of the current developing fisheries in the Region (addendum to WP 99/43).

There was considerable discussion on the criteria used to judge when a fishery is in a particular stage and when it changes stages. The nomenclature used to define the three stages identified in the policy (Assessment, Stock Assessment, and Commercial), and the fact that these do not match the titles of the licences issued (Scientific, Exploratory and Commercial), does not promote clarity in this regard. Nonetheless, criteria are fairly straightforward for defining stages one and two. Transition to the third, commercial, stage, which requires that the fishery be viewed as being "biologically and commercially sustainable", is problematical, however, as rigorous criteria for defining biological sustainability are not available. Little can be done about nomenclature as the licence names are in legislation and cannot be easily changed. However, the important problem is the absence of objective criteria for deciding on the commercialization of the fishery. This situation is not consistent with the PA. It was recommended that such criteria be developed and tabled at a future meeting of the WG.

ACTION: O'BOYLE and O. MURPHY

The effective functioning of the Developing Fisheries Policy is contingent on the appropriate information being collected during each stage and its availability at the decision points defined in the policy. At present, approaches to these requirements vary greatly among fisheries. Those responsible for application of the policy recognize a need for a more consistency. WG discussion focussed on the issue of peer review of fishery progress. Currently, RAP conducts reviews as required on the biological status of a resource. However, no equivalent review of the socio-economic information is conducted, although RAP is structured to provide this. It was recommended that when a fishery is up for review, that RAP be the forum to evaluate all technical (biological and socio-economic) aspects of

the fishery. This approach should be tried on the next occasion that a developing fishery is up for review.

ACTION: O'BOYLE and O. MURPHY

2.5 Management structures/institutions

This was not addressed as a separate item. It was decided to draft new sections on management institutions as part of a revised version of the February 1999 report (see agenda item 2.6).

2.6 Approval of report from February 1999 meeting

The WG agreed that it should provide a document that would foster dialogue on the PA by identifying and clarifying issues and, by so doing, support regional efforts to introduce the PA to all elements of harvest fisheries management. It was decided that the document would be most appropriately titled a 'discussion paper'. The draft report of the February 1999 meeting was reviewed in this context and decisions made on restructuring, on revisions to the present text, and on additions required. The revised draft outline agreed to is in Annex 4. A drafting group (Gavaris, Halliday, O'Boyle, Stephenson) was established to complete these changes after the meeting. Attempts will be made to obtain WG approval of the resultant draft by e-mail. Once completed, the discussion paper will be made available to the RAP Chairman for use as considered appropriate.

ACTION: HALLIDAY

A project outline was tabled for a pilot implementation of the PA for Southern Gulf of St. Lawrence cod (Annex 5). This project is being conducted under the auspices of the Strategic Science Fund project on the Precautionary Approach. The intention of the project is to engage managers, scientists and fishery participants in a process to describe what constitutes a PA to fishery management. This was viewed as a worthwhile complement and extension to the WG's activities.

3. DMP Implementation and Performance

This topic was discussed at the WG meeting of 23-25 February 1998 and it was recommended that procedures be devised to ensure the reliability of landings data. In response, a contract for a comparison of Scotia-Fundy Sector databases for inconsistencies in reporting was funded through the Strategic Science Fund. This was a pilot project only to evaluate problems and identify promising avenues to explore. The work was conducted by BIOREX under the direction, and with the support, of a team of DFO staff from Enforcement, Statistics, Resource Allocation and Science. Team members facilitated access to relevant data from Catch and Effort (DMP), Observer, Air Surveillance (CFIN) and Surface Surveillance data files. A provisional summary of the contract report (Annex 6) was presented to the WG.

The report provided an indication of the changes required in management of the various data sets relevant to fishery monitoring if these are to be used to evaluate the accuracy and completeness of landings statistics. Those that relate to the DMP will be effected by the implementation of the Fisheries Information System Project (FISP). However, there is at present no linkage planned between FISP and CFIN, the primary source of at-sea vessel sightings. The CFIN data, along with surface surveillance vessel sightings (presently in hard copy only) provide the primary data on fishing activity independent from the DMP. Linkages among these data sets are needed so that comparisons between them can be instituted on a routine basis. The opportunity is there also, to fine tune air surveillance data collection to optimize the probability of sighting vessels that are bypassing the DMP, if such exist.

The comparisons made identified a number of avenues of investigation worth pursuing further, in particular systematic differences between monitored and unmonitored vessels. The results give encouragement to think that a suite of edits based on such comparisons could be used routinely to detect deficiencies in the landings reporting system or, conversely, to provide assurances of system integrity. Such routine checks could be built into the FISP.

The study confirmed a problem of uneven distribution of dockside monitoring among vessels in 1997 (the study year), for fleets with less than 100% coverage. The randomized approach adopted for 1998 to counter this problem created logistical difficulties for the monitoring companies. An approach was suggested at this meeting of randomizing monitoring over clusters of ports to improve the practicality of the sampling plan.

Upgrading of Working Paper 98/55, which reviews the history and functioning of the DMP, has been delayed until all the changes instituted in the latest revision of the program are finalized.

4. Evaluation of Effort Regulation

The WG approved a plan for evaluation of effort regulation at its 23-25 February 1998 meeting (Annex 3 of Proceedings 98/09). Subsequently, aspects of the required work were supported through the Strategic Science Fund to develop methods for analyzing and classifying fishing activities on a spatial and temporal scale suitable for fishing effort monitoring. Two reports were presented to the meeting on this work.

The first, an approach for summarizing fishing effort of the Canadian groundfish fisheries on Georges Bank (Working Paper 99/42), identified five fishery components based on gear and species mix in catches. It then examined the possible effects on estimated 'effective' fishing effort of several confounding factors, vessel tonnage class, area fished, month and vessel persistence, through analysis of variance of ln catch rates in relation to these factors. (Vessel persistence was defined by years of participation in the fishery.) The study is continuing, the intention being to compare the effective effort series for each component with estimates of partial fishing mortality for relevant stocks.

The second report (Working Paper 99/39) on groundfish fisheries in St. Georges Bay (Southern Gulf of St. Lawrence) defined seven unique fishery types based on species composition of catches. Time series of catch rates were derived for the four species-directed fishery types using analysis of variance that included the effects of gear type, month of fishing and fishing vessel. There were many changes in the operations of these different fisheries during the study period that could have influenced these catch rates and the extent to which catch rates reflect local resource abundance remains to be established. The study highlights the difficulties of establishing measures of effective effort in localized coastal fisheries by small boats.

The WG was pleased to see that progress was being made on this subject. It was noted also that an ICES Theme Session at the 1999 annual meeting was the relationship of fishing mortality and fishing effort. The results of that session should be reviewed by the WG. The USA experience with effort regulation in the New England area, which has now been in place for several years, was also considered relevant and it was suggested that someone knowledgeable about the performance of this regulation could be invited to address a future WG meeting.

5. Community Management

The RAP Coordinating Committee, at its meeting of 19 September 1997, proposed that the WG undertake a review of the Community Management Board (CMB) approach. In 1997 a number of CMBs were established to facilitate the management of the Nova Scotia fixed gear fishery. In the RAP Coordinating Committee's view, it was important to keep abreast of these initiatives and monitor the effectiveness of these institutions as lessons may be learned for application elsewhere. A project was initiated through the Strategic Science Fund to document and evaluate the effects of CMBs on management of fixed gear groundfish fishing in the Scotia-Fundy Sector. A synopsis of the report of this project was presented to the WG (Annex 7). The report discusses why CMBs were established and describes the efforts of these Boards to implement community-based catch quota management. It then identifies possible indicators which could be used to measure Board performance, provides a preliminary assessment of their success, and discusses their potential to bring about positive change in the management of the inshore, fixed gear fleet. The WG requested that the full report (which was not finalized at the time of this meeting) be made available to interested participants.

ACTION: HALLIDAY

The WG learned that the Minister had approved changing the status of the CMBs from being short-term trials to being continuing components of the groundfish management system. The regional Resource Allocation Branch conducted the technical analysis that supported this decision. A copy of this analysis was requested by the WG.

ACTION: PEACOCK

It was decided that these Science and Resource Allocation reports should be used (along with other relevant documentation) at a future meeting to stimulate a discussion of the evaluation of fishery management systems, and the role that the WG might play in this regard.

6. Estimation of Discard Levels

At the 23-25 February 1998 meeting of the FMSWG, a paper was presented by J. Allard and G. Chouinard that outlined a method to detect discarding of small fish. The technique appeared to have potential, and the WG recommended a pilot project be conducted on a specific fishery. At the subsequent Fisheries Management Subcommittee (FMS) meeting of 26 February 1998 (Proceedings 98/15) it was recommended that such a pilot project be initiated for the late summer flatfish fishery in the Gulf of St. Lawrence and that another pilot elsewhere be encouraged.

A report was tabled at the present meeting outlining progress to date on a pilot discard study conducted during the 1998-99 haddock fishery off Southwest Nova Scotia (Div. 4X) (Working Paper 99/41). The length distribution of the unculled haddock catch was sampled at-sea by observers, and a team of shore samplers sampled landings of unobserved vessels.

Two groups were targeted for the project: the ITQ < 65' mobile gear fleet and the < 65' fixed gear fleet. Deployments to the ITQ fleet in October-November 1998 and January-March 1999 were moderately successful. Logistical difficulties in identifying fixed gear boats going to the study area, prior to their sailing, prevented any deployment of observers to this fleet (for the purpose of the study).

Two operational difficulties were apparent. Reporting of fishing location by vessel operators to shore samplers was remarkably imprecise. A comparison with commercial logbook data on area of capture showed many of the locations supplied to shore samplers did not correspond to areas where haddock was recorded as caught. Secondly, although observers were deployed based on a vessel captain's declared intention to fish in the study area, in some cases the vessel fished elsewhere, wasting the project's resources.

The discarding indices for the ITQ fleet (calculated using the methodology of Allard & Chouinard) for the shore-sampled catches were higher on average than the at-sea observer reference levels. The range of distribution of the indices was higher for the shore samples than the observed trips, as would be expected given a range of discarding practices among the fishermen.

Analysis of the data from the pilot is not complete. Further investigation is required on the location of capture of haddock sampled at time of landing to ensure that the proper comparisons are being made. Data on vessel distributions from aerial and surface surveillance could help resolve the problems encountered. This issue of location of fishing was recognized as being of critical importance, as the possible occurrence of small-scale variations in size composition by area and time is the potentially most serious criticism of the

method. The extent to which enforcement sampling by Surveillance Officers can be utilized to improve the at-sea sampling, and that DFO port sampling can augment shore samples, also remains to be investigated. Furthermore, sensitivity analysis on the length groupings used in the calculation of the discard indices is required.

Nonetheless, the results of this pilot encourage the view that practical implementation of the method is feasible. Attempts are being made to obtain funding for a second attempt to conduct a discard pilot project on the fixed gear fleet in Southwest Nova Scotia in 1999. It did not prove possible to conduct a pilot in the Gulf of St. Lawrence summer flatfish fishery in 1998 but another attempt will be made in 1999 to obtain funding. Work is in progress also, through collaboration between DFO and University of Moncton researchers, on a method to estimate discard quantities (as well as occurrence) using an extension of this methodology.

7. Levels of Observer Coverage

Bill Furlong and Patrick Martin, Department of Economics, University of Guelph presented a statistical model of optimal observer coverage and deployment. The presentation was based on a report prepared under contract for DFO Enforcement, Ottawa (Working Paper 99/40). The method is a generalization of that proposed by Allard and Chouinard for detection of discarding. The paper is intended to promote discussion of the relevant issues; as such, it is a conceptual paper and is not applied to actual data. It presents a theoretical model of enforcement with a partial coverage observer program and then advances several test statistics for model implementation.

Previous studies have recommended a random deployment of observers to vessels. They have argued that this increases statistical confidence that sample data from observer vessels can infer fishing activity for the entire fleet. However, the present authors consider this conclusion dubious and that a vessel with an onboard observer can be assumed fully compliant with regulations. Thus, behaviour of vessels with observers may be markedly different from that without observers. Data from vessels with observers would therefore provide biased estimates of fleetwide fishing activity.

The paper states that, if observer deployment is random, the optimal coverage level (at least from an enforcement perspective) is either zero or complete. This result holds because the expected benefit of an additional observer is constant and independent of the vessel: if it pays to put an observer on one vessel, it pays to put them on all vessels in the fleet. A partial coverage regime would be optimal only if the benefit of an additional observer is decreasing in the number of observers -- this is equivalent to vessels having different propensities for noncompliance. The partial coverage regime is implemented by assigning observers to those vessels for which the cost of noncompliance is expected to be the greatest. This is the strategic deployment model. For any given coverage level, strategic deployment minimizes the average level of noncompliance on vessels without observers. Thus, the behaviour of

vessels with observers is closer to that without, and sample data from one set may better infer fishing activity in the other.

A central argument in this paper is that most violations are motivated by profit and will therefore manifest themselves in above average profit levels. These in turn result in above average value of landings (or landings per unit effort). There is therefore a positive linkage between value of landings and noncompliance. Since landings are (in principle) observable dockside, once the relationship between landings and violations is known, so is noncompliance. Although violations committed on vessels without observers may be directly unobservable, they can be statistically inferred by comparing landings data drawn from two samples: vessels with and vessels without onboard observers.

Other factors besides violations can also explain unusually high landings (e.g., luck, differences in productivity, seasonality, etc.). Once these have been statistically accounted for, the ranking of vessels by landings can be used to generate a ranking of vessels by their likelihood of noncompliance -- this serves as the basis for constructing a noncompliance index for strategic deployment. Further, since productivity and luck are independent of whether or not a vessel has an observer onboard, the difference in mean landings between these two groups of vessels is the average value of landings attributable to noncompliance. This serves as a proxy measure of the enforcement benefit of an additional observer. DFO could employ this information in its determination and negotiating of coverage levels.

Although a difference in mean landings between the two groups of vessels indicates that noncompliance is present, it does not indicate that the propensity to violate differs across vessels (which is necessary to justify a partial coverage regime). A difference in the variances of the two distributions does however provide evidence of differing propensities to violate. The paper reviews several statistical tests that can be used to test the difference in the means and variances between the two samples of landings corresponding to vessels with and without observers. One, the Rank Sum Test, is an intuitively appealing test and can be readily implemented with the appropriate software.

Strategic deployment of observers to vessels requires that an index which ranks each vessel's likelihood of noncompliance be developed. Several methods for generating this index are considered. For example, the difference in mean landings for the sample populations of observerless and observer vessels could be compared to the equivalent difference in means for an individual vessel. The Median Test and The Rank Sum Test are more sophisticated means of generating the probability index of noncompliance and have well-known statistical properties. Each approach filters out productivity differences so that the only remaining explanation of consistently different landings is noncompliance.

There was considerable debate in the WG about the validity of the main premise that violations will be reflected in differences in landings per unit effort, given the complex regulatory environment in present fisheries. It was recognized, however, that the only test was to apply the method to real data. There are historical data sets that would be useful for this purpose that could be made available to analysts prepared to take on such a task. It was

emphasized, however, that an intimate knowledge of the fisheries and the data is essential if the application is to be done appropriately. A number of WG participants expressed a willingness to cooperate in facilitating such a project. It was agreed that the views of the WG would be brought to the attention of the National Observer Coordinating Committee with a recommendation for further work.

ACTION: SHOWELL

With regard to action items from the 23-25 February 1998 meeting, it was agreed that comparisons of observer coverage levels prior to 1997 with those subsequent to the introduction of the user-pay policy were no longer relevant but that monitoring of post-1996 trends remained of interest. However, no statistics were available for the present meeting. The Furlong and Martin model, along with the pilot experiment on discard detection (agenda item 6), represent substantive progress in identifying specific issues suitable to be addressed by observer deployments and more work along these lines is likely to be fruitful.

It was pointed out (as it had been at the 23-25 February 1998 meeting) that the observer program was only one tool for fishery monitoring and decisions on observer usage needed to be weighed based on costs and benefits of observers versus other methods. It was agreed to develop a proposal for a review by the WG of fisheries monitoring as a whole. This would require support and active participation from the various Branches involved, particularly Enforcement. It was agreed to explore whether there was support for such a review and, if so, develop terms of reference for it.

ACTION: GAVARIS

8. Other Business

8.1 Review of management plans

The WG's recommendations for modifications to the IFMP template, made at its 23-25 February 1998 meeting, were presented to the National Partnering Working Group (NPWG), which is responsible for managing the IFMP process. The NPWG recognized the work as a positive initiative and some of the key requirements identified by the WG were incorporated into the Framework and Guidelines for implementing the Co-management Approach Volume II. However, no changes were made to the IFMP template as a result of the WG proposals.

Although the WG did not see itself becoming involved in the routine evaluation of plans, the FMS, at it's meeting of 26 February 1998, requested the WG to evaluate two Gulf Sector IFMPs. There was insufficient time to discuss this item.

8.2 Participation of Gulf Sector enforcement personnel in the WG

There was insufficient time to discuss this item.

8.3 Reports from other groups

There was insufficient time to discuss this item.

9. Next Meeting

No arrangements were made with regard to the next meeting.

Annex 1 (February Meeting).

AGENDA

FMSWG Meeting, 24-25 February 1999

On Application of the Precautionary Approach

In the Maritimes Region

1. Approval of Agenda
2. What is the scope of the Precautionary Approach (PA)?
3. What has Canada done about it to date?
    a) DFO
    b) FRCC
4. Biological Reference Points
5. Decision Rules (Harvest Control Laws)
    a) are special rules necessary for re-opening fisheries?
6. Should we have economic and social Reference Points?
7. Long-term Objectives:
    a) Are they essential to application of the PA?
    b) Do we have any?
    c) How long is "long-term"?
8. Should fishery management plans have objectives restricting the environmental effects of fishing?
    a) Incidental mortalities of bycatch species (incl. ghost fishing)
    b) Effects of fishing gear on productivity of benthic communities
9. Should fishery management plans have objectives restricting the ecosystem level effects of fishing?
    a) Predator/prey considerations
    b) Biodiversity
    c) The role of Marine Protected Areas
10. Are the appropriate data on the fisheries being collected to support a Precautionary Approach?

a) Statistics on landings and fishing effort?

b) Estimates of discards, and their species and size composition?

c) Statistics on the fleet (numbers licensed, tonnages, adoptions of new technology)?

d) Numbers of people employed in the industry (fishermen, plant workers)?

e) Economic returns from fishing?

11. Is the level of compliance with harvesting rules presently achieved adequate to support a Precautionary Approach?

a) Is there a mechanism in place to measure levels of compliance?

b) If not, what approaches are possible?

12. Does the Precautionary Approach require controls on fishing technologies used through an authorization procedure?

a) What technologies could be controlled?

b) How could such controls be implemented?

c) Should there be some standardization of the construction of fishing gears?

13. What are the implications for Fishery Science of adopting the Precautionary Approach?

a) How is the necessary biological-economic-social information framework going to be generated?

14. Management Framework:

a) Does the IFMP provide an adequate framework for precautionary management?

b) Is the Policy on Developing Fisheries consistent with the PA?

c) Who sets the decision rules and who applies them?

d) Implications for the role of FRCC

e) Implications for RAP

15. Where do we go from here?

a) What role can the RAP Fisheries Management Subcommittee (FMS) and the FMS WG play in Regional adoption of a Precautionary Approach to management?

Annex 2 (February Meeting).

LIST OF PARTICIPANTS
(for some or all of the meeting)

Annand, Chris - Resource Allocation Branch, Halifax

Brander, Leo - Policy and Economics Branch, Halifax

Burke, Leslie - Policy and Economics Branch, Halifax

d'Entremont, Jean-Guy - Fisheries Resource Conservation Council

Fanning, Paul - Science Branch, Dartmouth

Frank, Kenneth - Science Branch, Dartmouth

Halliday, Ralph - Science Branch, Dartmouth (Chairman)

Hurley, Peter - Science Branch, Dartmouth

Liew, Doreen - Policy and Economics Branch, Halifax

Meltzer, Evelyne - Policy and Economics Branch, Halifax

Miller, Robert - Science Branch, Dartmouth

O'Boyle, Robert - Science Branch, Dartmouth

Sinclair, Michael - Science Branch, Dartmouth

Stephenson, Robert - Science Branch, St. Andrews

Annex 1 (June Meeting).

AGENDA

Fisheries Management Studies Working Group
Meeting of 21-23 June 1999

1. Approval of Agenda

2. Use of a Precautionary Approach in Maritimes Region

   2.1 Reference Points and Decision Rules

   2.2 A PA Audit for Integrated Fishery Management Plans

   - A draft checklist of a PA audit for IFMPs is to be tabled

   - A briefing on changes in the IFMP template for 1999 is required

   2.3 Area-based review of IFMPs

   2.4 Developing Fisheries Policy

   2.5 Management structures/institutions

   2.6 Approval of report from February 1999 meeting

3. DMP Implementation and Performance

   3.1 Report on evaluation of whether the Dockside Monitoring Program is being by-passed

   3.2 Status of Working Paper 98/55

4. Evaluation of Effort Regulation - Methods for analyzing and classifying fishing activities on a spatial and temporal scale suitable for fishing effort monitoring

5. Community Management - the effects of Community Management Boards on the overall management system of fixed gear groundfish in Scotia-Fundy

6. Estimation of Discard Levels - Pilot project on the use of at-sea observers to detect discarding of small haddock

7. Levels of Observer Coverage

7.1 Progress in documenting observer coverage trends and specific issues suitable to be addressed by observer deployments

7.2 Furlong, W. J. and P. M. Martin: A Statistical Model of Optimal Observer Coverage and Deployment

8. Other Business

8.1 Review of management plans

8.2 Brian Wood to discuss with Gulf Sector colleagues the prospects for their regular participation in the work of the Working Group

8.3 Reports from other groups

9. Next Meeting

Annex 2 (June Meeting).

LIST OF PARTICIPANTS
(for some or all of the meeting)

Allard, Jacques	University of Moncton
Annand, Chris	DFO-Resource Management, Halifax
Chouinard, Ghislain	DFO- Science, MFD, Moncton
Coffen-Smout, Scott	DFO-Oceans Act Coordination Office, Dartmouth
Fanning, Paul	DFO- Science, MFD, Dartmouth
Frank, Ken	DFO- Science, MFD, Dartmouth
Furlong, Bill	University of Guelph
Gavaris, Stratis	DFO-Science, MFD, St. Andrews
Glover, Anne	DFO-Oceans Act Coordination Office, Dartmouth
Halliday, Ralph	DFO- Science, MFD, Dartmouth (Chairman)
Herbert, Glen	DFO-Oceans Act Coordination Office, Dartmouth
Hurlbut, Tom	DFO- Science, MFD, Moncton
Koeller, Peter	DFO- Science, Invert. Div., Dartmouth
Martin, Patrick	University of Guelph
Morin, Rod	DFO- Science, MFD, Moncton
Murphy, Odette	DFO-Resource Management, Halifax
O'Boyle, Bob	DFO- Science, RAP Office, Dartmouth
Paulin, Laurent	DFO-Resource Management, Moncton
Peacock, Greg	DFO-Resource Management, Halifax
Showell, Mark	DFO- Science, MFD, Dartmouth
Stephenson, Rob	DFO-Science, MFD, St. Andrews
Swain, Doug	DFO- Science, MFD, Moncton

Annex 3 (June Meeting).

List of Working Papers Reviewed

99/39[1] Sinclair, A. Groundfish fisheries in St. Georges Bay.

99/40[1] Furlong, W.J. and P.M. Martin. A statistical model of optimal observer coverage and deployment.

99/41 Showell, M. A. Discarding in the 4X haddock fishery – practical application of a discarding index.

99/42 Shepherd, T. and S. Gavaris. An approach for summarising fishing effort of the Canadian groundfish fisheries on Georges Bank.

99/43 O'Boyle. The emerging fisheries policy. Also addendum: DFO – inventory of developing species/fisheries – June 1999.

99/44 Frank, K. Stock status indicators for re-opening closed fisheries.

99/50 O'Boyle, R.N. and A. Glover. An overview of IFMPs relevant to the Eastern Scotian Shelf from a Fisheries and an Oceans perspective.

Other Papers Reviewed

Koeller, P. A. 1999. Fisheries impact assessment – a good, bad and ugly approach to precautionary shrimp stock management. NAFO SCR Doc. 99/1, Ser. No. N4042, 7p.

[1] Upgrade to Research Document recommended.

Annex 4 (June Meeting).

On Implementation of the Precautionary Approach for Harvest Fisheries in the Maritime Region

A Discussion Paper Outline

1. **Introduction (old section 1 with editing)**
   - Background on the Precautionary Approach (PA)
   - Purpose of the discussion paper
     1. Foster dialogue and communication
     2. Clarify issues on the PA
     3. Support PA efforts

2. **The Precautionary Approach (editing of Rob's, Bob's, old FMSWG info, plus input of WG)**
   - Broadly speaking, the PA directs us to
     i) Define unacceptable outcomes
     ii) Take uncertainty into account
     iii) Implement a decision process
   - Requires objectives relating to conservation and socio-economics
   - Requires reference points and unacceptable states at which pre-defined management actions occur.
   - Requires effective regulatory and assessment activities, both with associated measures of risk and uncertainty.
   - Requires an effective decision-making process and consultation among stakeholders
   - The PA is more than the sum of the parts – it represents an integrated management system in which all components are working together to achieve stated objectives, in which the performance of the system and its components are monitored on a on-going basis, and in which the risk and uncertainty of achieving stated goals is accounted for in management decisions.

3. **What Canada has done**
   - Background on NAFO, ICES and ICCAT (new par.)
   - HPPPA (old section 3.1)
   - FRCC (old section 3.2)
   - Summary (old section 3.3)

4. **The Objectives under the PA**
   - Current Fisheries Policy (old section 7.1)
   - Implications of the Oceans Act - the Ecosystem Effects of Fishing (part of old section 5)

5. **Performance Indicators and Reference Points**
   - Introduction (new)
   - For Conservation
     - i) Stock-related (old section 4.1)
     - ii) Ecosystem-related (part of old section 5)
   - For Socio-economics (old section 4.3)
   - Implementation of the PA
     - i) Old section 7.4 (performance indicators)
     - ii) Old section 6 (regulation of technology)

6. **The Role of Uncertainty in the PA (new)**
   - New with PA
   - Must account for uncertainty of achieving objectives
   - More ignorance translates to more caution
   - Link performance indicators and RPs with uncertainty

7. **The Decision-making Structures and Processes**
   - Intro on need for effective management structures and processes (new)
   - Requirement for technical review (new)
     - i) RAP, ZAP, TRAC, etc
     - ii) Reviews stock status and specific fisheries issues
     - iii) Needs to be charged with identifying indicators, RPs and uncertainty
     - iv) Investigates alternative RPs and options
   - Requirement for Decision-making (lots new)
     - i) Advisory committees, FRCC, etc
       - ➢ Need institutions for ecosystem considerations
     - ii) Decision Rules (old section 4.4)
     - iii) Decision Rules for re-opening fisheries (old section 4.2)
     - iv) Decision Rules on overexploited species (new)
     - v) Role of Integrated Fisheries Management Plans (old section 7.2)
       - ➢ Don't have plans for everything
       - ➢ Needs more rigor
   - Policy for Developing Fisheries (old section 7.3)

8. **Summary (new)**
   - Reiterate what the PA is
   - Where do we go from here

Annex 5 (June Meeting).

The Precautionary Approach and Fisheries Management
Pilot Implementation for Southern Gulf of St. Lawrence Cod

Project Outline

Background

Since the 1992 Rio declaration and 1995 UNFA, there has been a great deal of activity in various fisheries organizations to both define what a precautionary approach (PA) to fisheries management is and implement the approach. The most active organizations have been ICES and NAFO, both of which have focused on the appropriate reference points and decision rules.

In Canada, the three year High Priority Project on the Precautionary Approach (HPPPA) has facilitated dialogue in the scientific community on the PA and has established a network of case studies across the country that allow examination of the PA under different management and data situations. The Maritimes Region's Fisheries Management Studies Working Group (FMSWG) has also been discussing the PA and has taken a more holistic view of the PA. Overall, however, in Canada, there has not been much movement towards the PA beyond the dialogue stage.

Objectives

1. To communicate to managers, scientists and DFO clients in the Gulf cod fishery what constitutes a precautionary approach to fisheries management

2. To examine the current fisheries management system and determine which elements need to be changed to be made precautionary

3. To implement the necessary changes

Description

A PA directs us to 1) define unacceptable outcomes, 2) take uncertainty into account and 3) implement a decision process. In other words, it instructs us to set objectives and associated targets to achieve these and also avoid bad situations, and put into effect measures that have more certainty of achieving the goals. The FMSWG considers that to be precautionary, one must have a management system in which all of the components are both effective and functioning together. The whole is more than the sum of the parts.

The project will examine all elements of the fisheries management of 4TVn cod, from objectives to assessment, with the aim being identification of those elements that require change. The elements to be considered are:

Objectives

What are the long-term objectives for this fishery and how do conservation, economics and employment relate in these?

Strategies

The current strategy to achieve conservation goals appears to be a mix of F0.1 and Spawning Stock Biomass (SSB). No reference points are defined for other objectives. The project will investigate target and limit reference points and a decision rule framework, drawing freely from the HPPPA case study.

Tactics

A suite of regulations is being used to manage the fishery. Performance measures will be defined to allow determination of how effective these regulations have been and the level of compliance

Assessment

The HPPPA case study has spent much effort on how to determine the level of risk and uncertainty in the biological assessment. The concepts will be incorporated into the assessment process.

Schedule

The project will depend heavily on communication and dialogue with managers and industry. To this end, the following meetings will be held:
July 1999: RAP meeting with Gulf managers to both describe the PA and outline the project. Dialogue will also be needed with the FRCC on this to ensure that they are aware of the project.
September 1999: Special meeting of the Gulf Groundfish Advisory Committee (GGAC) to describe the PA and outline the project. At this meeting, it would be useful to strike a Gulf Cod WG to develop a draft PA for the fishery.
Fall 1999: Analyses by the WG with consideration of technical elements by the FMSWG.
Jan 2000: Presentation of the WG report to the FRCC and GGAC

Team

G. Chouinard
A. Sinclair
R. O'Boyle
M. Mallet
Others?

Annex 6 (June Meeting).

Evaluation of the Consistency of Statistical Information from the Groundfish Commercial Fishery

Provisional Summary of a Contract Report from BIOREX

By

R. G. Halliday
(Contract Authority)

A contract for a comparison of Scotia-Fundy Sector (Maritimes Region, DFO) databases for inconsistencies in reporting of landings data was funded through the Strategic Science Fund. This was a pilot project only to evaluate problems and identify promising avenues to explore. The work was conducted by BIOREX under the direction, and with the support, of a team of DFO staff from Enforcement, Statistics, Resource Allocation and Science. Team members facilitated access to relevant data from Catch and Effort, Observer, Air Surveillance and Surface Surveillance data files.

The analysis was based on calendar year 1997 data for the five fleet sectors: EA, MG<65' ITQ, Generalist, FG<45' and FG 45-65'. Much of the contractor's time was devoted to acquiring the necessary data from the various sources and matching these up to provide analyzable data sets. The catch and effort database managed by the Policy and Economics Branch contains hail-out (HO), hail-in (HI) and sales slip (SL) records which required matching and consolidation on a trip basis. Air surveillance records are in the Canadian Fisheries Information Network (CFIN), as are Observer sightings of vessels. This database is managed in Ottawa. However, sightings and boardings from surface (patrol vessel) surveillance are not computerized and were extracted by hand from original records held in the regional Enforcement office. Observer data on catch quantities was extracted from the Science-managed Observer database. Obviously, any implementation of routine cross-checking of data from different sources would require a reorganization of the way these data are managed.

Overall, 94.6% of trips in the catch and effort database had a complete set of records (HI, SL, and HO when required). The HO documents were developed for enforcement purposes to assist in tracking fishing vessel activity on a real-time basis. Although the records are retained in the database, no other purpose for these has been identified and the data are not edited. They indicate a high compliance with hail-out requirements, but there were 1267 cases with only a HO record. These are likely attributable to inadequate cancellation procedures and lack of editing. If HO documents are to be useful in after-the-fact edits, they must themselves be made reliable.

Virtually all trips (99.5%) had the two other documents, SL and HI. However, this exaggerates slightly the completeness of original documentation. Statistics personnel conduct checks periodically during the year to determine if all HI have matching SL. In cases where there is a HI, but no matching SL can be obtained, a 'supplementary' SL is created by entering the HI values for catch weights. This ensures that all catch weights are accounted for. There were 246 records (about 1%) created by duplicating HI information. A separate record is kept of these substitutions, but they should be flagged in the database also.

A considerable number of trips (1055) had HIs indicating non-offloading port visits. The majority (725) of these involved vessels of the FG<45' fleet. Thus, non-offloading port visits were made on 3.8% of the trips by this fleet. The reasons for this deserve investigation.

Matches were obtained between CFIN data (almost 6000 air and Observer at-sea sightings) and HI and SI data for 4.5% of the trips in the catch and effort database. Although this provides an estimate of the probability of being sighted, of much greater interest, of course, is the number of CFIN sightings of groundfish vessels *not* recorded as active, at the time of sighting, in the catch and effort database. Unfortunately, this comparison was not made. Surface surveillance sightings/boardings totaled about 260 records, but time did not allow these un-computerized records to be adequately examined. Collectively, these sightings data provide the only way (other than onshore investigation) to detect vessels that are illegally bypassing Departmental reporting requirements. Matching up these records could provide a quantitative estimate of the amount of illegal fishing and an approximation of the resulting unreported catch, and further work on this deserves a high priority.

Catch weights by species on HI documents are lower than on SLs by as much as 20%, on average, in mobile gear fleets, but usually less than 5% for fixed gear fleets, for gadoids and redfish. Flatfish comparisons were invalidated by differing reporting practices on HI and SL documents. On an individual trip basis the differences could, of course, be much greater. However, as the fleets with the greatest underestimates were subject to 100% dockside monitoring, there is no obvious advantage to this underestimating. A subset of 79 trips had observers aboard, allowing comparisons between aggregate observer catch estimates for the trip and those from SLs and HIs. For this subset, HI catch estimates were still lower than SL estimates by about the same amount as for the data as a whole. Thus the presence of an observer did not affect hailing practices. Observer weights also tended to be rather lower than SL records for mobile gear boats, but slightly higher for fixed gear boats. Thus no major inconsistencies were identified.

The project explored the available data on the activities of Dockside Monitoring Companies in relation to the DMP targets for the various fleets, and the seasonal distribution of monitoring in relation to fleet activity. The data provide much detail about the interactions of individual monitors and boats. The rotation of dockside monitors among vessels can be examined and a 'monitor rotation index' was developed that could be used to examine the dispersion of monitors in relation to boats. A more detailed investigation of the distributional characteristics of monitoring coverage has the potential to unearth anomalies that could be indicators of infractions. Differences in the average landed weight (from the SL) between

trips monitored and not monitored by DMP for fleets with only partial monitoring requirements present another avenue of investigation. The ratio between HI and SL catch estimates between monitored and un-monitored trips could also indicate reporting inconsistencies. These represent further avenues of investigation that could not be adequately explored under the present contract but which deserve further attention.

In summary, the contract work provided an indication of the changes required in management of the various data sets relevant to fishery monitoring if these are to be used to evaluate the accuracy and completeness of landings statistics. The comparisons made identified a number of avenues of investigation worth pursuing further. The results give encouragement to think that a suite of edits based on such comparisons could be used to detect infractions in the landings reporting system or, conversely, to provide assurances of system integrity.

Annex 7 (June Meeting).

The Effects of Community Management Boards on the Overall Management System of Fixed Gear Groundfish in Scotia-Fundy

Final Report Synopsis
June 18, 1999

Lucia Fanning
Marine Affairs Program, Dalhousie University

1. Purpose, Methodology and Definitions

With an operational history of approximately two years within the Scotia-Fundy region, the practice of community-based quota management for groundfish by the inshore, fixed gear sector provides an opportunity to examine the potential applicability of this management approach within the overall Atlantic groundfish management system. By examining the issues confronted by the inshore sector and the attempts to address these under a community-based management approach, the purpose of this research effort is to provide an increased understanding of the effects of community-based management in effectively addressing the problems facing the inshore sector. Such an analysis is intended to highlight important lessons which could be of benefit to both the communities of resource users and DFO, as they develop and implement solutions to address the challenges arising from managing a common property resource such as the Atlantic groundfish.

The methodology employed in conducting the research was based primarily on a review of appropriate documents and reports, attendance at DFO-industry meetings relating to the management of the inshore, fixed gear sector and interviews (both structure and unstructured) with selected government personnel and resource users comprising all eight of the DFO-recognized community management boards[1]. Given the complexity of the subject matter under examination and time constraints which limited the ability to conduct a detailed research effort on each of the boards, this report provides a more general comparison of the boards than was anticipated. However, it should be noted that, in some instances, the degree of detail discussed for a particular board may be more than that reported for the remaining boards.

The following definitions of community, quota management and community-based quota management are used in the report:

"community"

- this term follows the definition provided by Matthews (1993) in that it refers to an entity whose members share a sense of intimacy and control over the entity which is derived from habitual use by the same users.

"quota management"

[1] All aspects of the research was conducted over the period September 1998 to March 1999. Community boards interviewed were: Halifax West, Eastern NS, Lunenburg-Queens, Shelburne A and B, Yarmouth, Digby, South-west New Brunswick.

- the strategies developed in response to rules, regulations and norms governing the right to harvest a specific catch of fish as allocated by the Canadian Minister of Fisheries and Oceans

"community-based quota management"

- quota management strategies which are devised and implemented by users of the resource who are members of an identified community.

2. Final Report Format

This research focused on an *ex post facto* evaluation of community-based quota management as a viable approach to attaining the management goals set by government for the inshore, fixed gear groundfish sector within the 4X5Y fishing areas of the Scotia-Fundy region. Based on the information collected, the final report:

(i) Sets the stage for an examination of community-based quota management by providing an overview of key factors considered responsible for problems associated with the Atlantic fisheries in general since the mid-seventies.

A review of the literature examining the Atlantic fishery over the past two decades has identified three fundamental problems within the industry. These are itemized as: (i) an overdependence by Atlantic Canadians on the fishery; (ii) excessive pressures on the resource; and, (iii) overcapacity in both the harvesting and processing sectors. In attempting to explain the sources of these problems, Cashin (1993) attributed the overabundance of people and capacity within the fishery to a social, historical tradition in Atlantic Canada of a "right to fish", a lack of economic alternatives and the use of the fishery as the employer of last resort. Furthermore, it was argued that with increasing overdependence, pressures on the resource were exacerbated by a variety of factors, including the application of new fishing technologies and mismanagement of the resource, such as a failure to control entry and enforce limits and a lack of meaningful partnerships between government and the users of the resource.

Despite being among the most highly regulated industries in Canada, the imbalance between fishing capacity and resource shares in the Atlantic fishery, particularly in the inshore fleet, reached crisis proportion[2]. The vicious circle of overcapacity leading to greater pressures on the resource, along with the conflicting objectives of economic efficiency and maximizing employment, contributed to the eventual collapse of the groundfish in parts of Atlantic Canada and the severe decline in stocks in other NAFO-designated areas by 1993[3].

(ii) Discusses why community boards were established by examining the current rationale behind the adoption of community-based quota management as a potentially

[2] R.G. Halliday, F.G. Peacock and D.L. Burke. 1992. *Development of Management Measures for the Groundfish Fishery in Atlantic Canada: A Case Study of the Nova Scotia Inshore Fleet.* Marine Policy (Nov. 1992), pp. 411-426.

[3] M. Sinclair, R. O'Boyle and G. Peacock. 1998. *Why Some Fisheries Survive and Others Collapse?* Second World Fisheries Congress., pp. 23-35.

successful approach to managing the inshore, fixed gear sector within the Scotia-Fundy region of Atlantic Canada.

The concept of community management for the Scotia-Fundy region was initially raised in 1995 by Sambro as an alternative to the DFO-imposed trip-limit type fishery, given the closure of the 4VsW groundfish fishery and the resulting distances fishers from this community needed to travel in order to fish in 4X5Y[4]. The concept gained further support among industry representatives in 1996 as a trial quota-group type fishery was prosecuted, for which conservation harvesting plans were developed and managed by fishing associations. The trial process undertaken in 1996 was followed by a unanimous industry recommendation to develop geographical community groups for the region, administered by community management boards. Support for community management among the resource users rested primarily on the assumption that it would allow fishers the flexibility to respond to the seasonality and fishing patterns of the various communities along the Scotia-Fundy shore. In addition to these elements, three other factors have been identified as influencing the introduction of community management. These included: (i) the abolition of the previously allowed 3,300 pound daily by-catch trip limit once the total allowable catch was reached; (ii) the requirement by DFO for conservation harvesting plans for all species prior to the commencement of harvesting activity; and, (iii) the requirement by DFO for all fish to be landed, thereby eliminating DFO-regulated trip limits.
All of the above factors led to an increasing demand by fishers to become more involved in the micro-level management of the fishery since it was in their interest to ensure that the harvesting plans adequately addressed the fishing patterns which most benefited their communities.

(iii) Describes the efforts of community boards to implement community-based quota management, as influenced by the major issues confronting them and the differing approaches taken by individual boards in response to these issues;

Within each of the communities, a management board was formed by the fishers to develop an annual conservation harvesting plan and to determined how their share of the quota were to be shared among member associations, whose fishers were registered to a port within the designated "community". To date, eight community management boards oversee the harvesting of the community quota by their members, with two boards, A and B, representing fishers in Shelburne County. Major issue confronting community management boards include: (i) organizational issues; (ii) legal and regulatory issues; (iii) socio-economic issues; and, (iv) scientific issues. The response by individual boards to these issues is influenced in large part by the underlying philosophy governing that board's management decisions (e.g. equal share basis, catch history or open-competitive fishery).

[4] S. Ellsworth, Sambro Fisheries, personal communication

Table 1 illustrates the diversity in numbers of associations, active licences, quota shares for each of the two completed years under community board management and method of sub-allocation associated with each of the management boards. Management board membership ranges from a total of one association (in Halifax West and Yarmouth) to five in Shelburne B and Eastern Nova Scotia. South West New Brunswick and Shelburne A each have three associations making up their management boards while the remaining boards in Digby and Lunenburg-Queens have two associations each.

(iv) Highlights possible indicators which may be used to measure the success of community-based quota management as a comparable alternative for attaining both the goals set by government for the sector and the corresponding needs of the fishers;

Any suite of indicators suggested to measure the performance of community-based quota management must clarify that success is to be gauged on matching the attainment of government conservation-based goals with the needs expressed by inshore handline, gill net and longline fishers in Scotia-Fundy. These needs have been listed as: protecting access rights to the fishery; ensuring a longer fishing season; and, maximizing the economic value of the resource through flexible decision-making.

A number of possible performance indicators may be available to measure the success of community-based quota management, recognizing that DFO assigns quota and issues licences. These are derived from the following hypotheses:

(1) the greater the percentage of eligible fishers participating in community-based quota management, as compared to other management schemes, the more successful the approach is over other alternatives (performance indicator - number of fishers in community-based quota management versus other forms of management schemes);

(2) the more the content of rules and regulations coincide with the way the fishers themselves define their problems, the greater will be the acceptance of these regulations by the fishers (performance indicators - length of active fishing season; degree of compliance by fishers with community quota allocation; number of community/joint scientific research projects);

(3) the more equitable restrictions are imposed, the more legitimate will the rules and regulations be regarded (performance indicator - number of infarctions by fishers to management plan devised by community boards);

(4) the more users are involved in the decision making process, the more legitimate the process will be perceived (performance indicator - degree of participation in reporting accurate catch and effort data);

(5) the more directly involved users are in installing and regulating rules and regulations, the more the rules and regulations will be accepted as legitimate (performance indicator - degree of reduction in over-capacity; degree of involvement in new fishing opportunities; degree of increased responsibility requested by community boards).

(v) Provides a preliminary assessment of the current success of community boards in managing the inshore, fixed gear sector within the Scotia-Fundy region of Atlantic Canada;

Using a selection of the above performance indicators as a measure for assessing the success achieved to date by community boards, community-based quota management was considered by the fishers to have significantly contributed to addressing the needs of the fishers. With declining allowable catch and changes in the regulations that sought to promote the government's goal of conservation, community management provided the inshore fishers with an opportunity to focus their collective efforts on achieving industry-specific goals, within the constraints of the DFO-determined quota allocations. In structured interviews with all eight management boards, it was unanimously confirmed that the degree of certainty available to fishers in planning their fishing season activities was increased under community-based quota management and that the degree of fishers' involvement in the management of the resource had correspondingly increased. Costs associated with this greater degree of involvement was considered increased somewhat by 50% of the boards while the remaining 50% claimed to have observed no cost increase. However, this search for common ground has led to the identification of a number of issues which have the potential to affect the overall ability of the community-based management board experiment to succeed. As perceived by individual fishers and the boards, the biggest challenge facing the sector is ensuring the viability of fishing as an economic activity, given declining quotas. In terms of an assessment of the success of the approach in attaining DFO-established goals, confidence in the accuracy of reporting across the entire sector remains an issue and attempts are currently being made to address this concern.

(vi) Concludes with a discussion on the potential of community management boards to serve as successful institutions for bringing about positive change within the inshore, fixed gear sector.

This paper has identified a number of issues which impact on the ability of the community quota management system to succeed where the more centralized approach to fisheries management has failed. While it has been argued that community involvement in the management of the resource is a positive step, there are many challenges that need to be identified and overcome if the survivability of the resource and the coastal communities that depend on the resource is to occur. Key among these is the recognition that matching government-developed strategic goals with the fishers' needs may be best achieved through the concept of subsidiarity, as opposed to a more commonly understood co-management approach. Subsidiarity differs from co-management in that it assigns decision-making that affects the micro-management of the fishery to those closest to the resource while allowing macro-level decisions to be made by government.

Table 1. Community-Based Quota Management Boards for the Fixed Gear, (<45 feet) Inshore Sector: Structure, Membership and Total Quota Allocated

NAME OF COMMUNITY BOARD	NUMBER OF ASSOCIA-TIONS	NUMBER OF LICENCED/ ACTIVE FISHERS 1997 1998	TOTAL GROUNDFISH[A] QUOTA IN TONNES 1997 (%SHARE) 1998	SUB-ALLOCATION METHOD TO ASSOCIATION MEMBERS	SUB-ALLOCATION METHOD TO INDIVIDUAL MEMBERS
Eastern Nova Scotia 4X Community Management Board (ENS)	5	75/52 59/47	798 (6%) 819 (6%)	By gear type, equal basis, based on number of boats	Needs of members and equal share basis, depending on group
Prospect Area Full Time Fishermen's Association Management Board (HfxW)	1	83/40 72/41	689 (5%) 820 (6%)	By gear type, equal basis based on number of boats	Equal share basis
Lunenburg-Queens Community Management Board	2	273/155 214/133	1908 (15%) 2613 (18%)	By gear type and need per group	Sharing formula based on species
Shelburne County Groundfish Management Board (ShelB)	5	Not available 382/293	Not available 6136 (51%)	By gear type, catch history and equal share basis	Catch history and equal share basis, breakdown depending on gear type
Shelburne County Management Board (ShelA)	3	Not available 152/129	Not available 644 (5%)	By gear type, competitive fishery	Competitive fishery
Yarmouth County Fixed Gear Management Board (Yar)	1	157/127 109/83	644 (5%) 859 (6%)	By gear type and catch history	Weekly trip limit by dollar value or pounds of fish caught, depending on gear type
Fundy Fixed Gear Council (Digby)	2	245/154 231/104	999 (8%) 1284 (9%)	By gear type	Equal share for gillnetters and weekly allowance for other gear type
South-west New Brunswick Groundfish Management Board (SWNB)	3	226/97 81/63	822 (7%) 927 (7%)	By gear type	By percentages set by gear sector
TOTAL	22	1691/1159 1308/897	12636 (100%) 14375 (100%)		

[A] Total ground fish values in this column relate only to cod, haddock and pollock. There was no quota allocated hake and halibut in 1997 while the quota for hake in 1998 amounted to 2200 tonnes.
Source: Department of Fisheries and Oceans, 1999.